REMARKS

Applicant respectfully requests reconsideration of the present application in view of the foregoing amendments and in view of the reasons that follow.

Claims 1, 6 – 8, and 11 are currently being amended.

This amendment adds, changes and/or deletes claims in this application. A detailed listing of all claims that are, or were, in the application, irrespective of whether the claim(s) remain under examination in the application, is presented, with an appropriate defined status identifier.

Claims 1-20 are pending in the case, and the Applicants respectfully request reconsideration of the claims.

Claims 1-20 were rejected as being obvious over Ashkin (4,893,886) in view of Matsui (US2002/0109923A1). First, it is important for the Examiner to note that there are substantial differences between the optical accelerators of the present invention and the conventional optical tweezers described in Ashkin '886. First of all, conventional optical tweezer are used in order to prevent objects from moving. Optical accelerators, on the other hand, are intended to transport objects along specific three-dimensional trajectories. In other words, and unlike conventional optical tweezers, optical accelerators are used to induce motion transverse to the optical axis—not to prevent such motion.

In light of the above, it is respectfully noted that Ashkin '886 in col. 1, ll. 23-25 describes a conventional optical trap with a conventional **radial** component of the gradient force. The reference to "traverse to the laser beam axis" relates only to how the particle is confined, **not** to

any forces other than the conventional optical trap. As stated in the Applicants' specification at paragraph [0004],

> "It is conventionally known that holographic optical traps may be used for manipulating small objects dispersed in a fluid. For example, material transport can result from a process resembling peristaltic pumping with a sequence of holographically-defined manifolds of traps resembling the states of a physical peristaltic pump. In all such conventional approaches, transport transverse to the optical axis cannot be accomplished by a single optical intensity pattern but rather requires three or more patterns of optical traps to be projected."

Further, as noted at paragraph [0008]:

> In order to carry out optical trapping in three dimensions, optical gradient forces created on the particle to be trapped must exceed other radiation pressures arising from light scattering and absorption. In general, this necessitates having the wave front of the light beam 12 to have an appropriate shape at the back aperture 24. For example, for a Gaussian TEM_{00} input laser beam, the beam diameter w should substantially coincide with the diameter of the back aperture 24. For more general beam profiles (such as Laguerre-Gaussian modes) comparable conditions can be formulated.

Consequently, this describes what Ashkin '886 teaches (a conventional optical trap), and the Applicants' invention is very different. As summarized in paragraph [0023]:

> "The present invention involves modifying the wavefront of a beam of light in a specific way to create a new type of optical trap useful for manipulating mesoscopic materials. When the modified beam is brought to a focus, the

resulting optical trap exerts forces transverse to the optical axis that can be used to **transport** (emphasis added) mesoscopic matter, such as nanoclusters, colloidal particles and biological cells. This new type of trap is created from a conventional beam of light such as a laser beam whose wavefronts are at least approximately planer. Focusing such a beam with a lens whose numerical aperture is sufficiently large results in a single beam gradient force optical trap known as an optical tweezer. Modifying the phase of the wavefront with a phase modulation $\phi(\vec{r})$ can modify the properties of the focused beams, and therefore the properties of the resulting optical traps."

Consequently, the **conventional** optical trap of Ashkin '886 is **modified** as stated above in order to accomplish the desired optical condition to enable particle transport unlike Ashkin. Claim 1 has been amended to note that once the transverse optical gradient component is added, the particles can be transported using those forces. The Ashkin '886 does not teach or disclose any such modification allowing transport without actually moving the entire optical trap (which is required by Ashkin '886 – see col. 4, ll. 17-22). Details of an exemplary mode of such particle transport using the Applicants' invention is described, for example, in paragraphs [0066] – [0069], [0073] – [0074] and paragraph [0076] which clearly are different methods of moving the particles than in Ashkin which just traps the particle requiring using the optical train or generating plural traps to move particles sequentially.

The Examiner also rejected claims 1, 2, 4, 7 and 9-20 over Ashkin '886 in view of Matsui. The Matsui reference does generally reference correction of spherical aberration but with no specifics whatsoever as to how that is done. There also is no teaching or suggestion of correcting for any other type of aberrations. Regarding claims 1 and 2 of the Applicants, there is

no element of correcting for aberration, being directed only to creating an optical trap with a transverse optical gradient which enables exerting transverse optical forces to be applied and using these forces to transport the particles. Thus, it is believed that Matsui adds no additional teaching to Ashkin which would affect patentability.

Regarding claims 4 and 7 the phase modulation component is directed to a specific preferred method of establishing an optical trap with the transverse optical gradient component which is a separate feature of the invention as opposed to aberration correction. Thus, it is believed that claims 4 and 7 are patentable over Ashkin in view of Matsui.

Regarding claims 9-20, independent claim 9 specifies substantial detail about how aberrations are corrected; and there is no such detail provided in the teachings of Matsui. Lacking any such teachings or suggestions in Matsui, it is believed claim 9 is patentable over Ashkin and Matsui.

Dependent claims 11-16 specify substantial specific detail about correction for aberrations, none of which are taught or disclosed by Matsui. Dependent claims 17-20 specify additional details of the optical system and methods of manipulation which solve important problems, none of which are taught or disclosed by the Matsui reference. Thus, claims 17-20 are believed to be patentable over the teachings of Ashkin and/or Matsui.

In view of the above amendments and explanation, it is believed that claims 1-20 are in condition for allowance. It is also likely the Applicants will be requesting a telephone Interview

to assist in reviewing the reasons for patentability over the cited references. Such an Interview would be appreciated.

In addition to the Amendment, Applicants are submitting a Petition to release the Applicants of any responsibility for the date of reply to the Office Action, which was not received from the U.S. Patent Office. As explained in the attached Petition and Declaration, it was only because of a docketed "Status Check" that it was discovered that an Office Action had occurred. The Applicants respectfully request processing of the Petition.

The Commissioner is hereby authorized to charge any additional fees which may be required regarding this application under 37 C.F.R. §§ 1.16-1.17, or credit any overpayment, to Deposit Account No. 06-1450. Should no proper payment be enclosed herewith, as by a check or credit card payment form being in the wrong amount, unsigned, post-dated, otherwise improper or informal or even entirely missing, the Commissioner is authorized to charge the unpaid amount to Deposit Account No. 06-1450.

Respectfully submitted,

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By [signature]

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